ORIGINAL ARTICLE

Impact of self-esteem on the oral-health-related quality of life of children with malocclusion

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Introduction: The purpose of this study was to examine the relationship between self-esteem and oral-health-related quality of life (OHRQoL) in a sample of children seeking orthodontic treatment in Toronto, Ontario, Canada. **Methods:** This was a cross-sectional study of children aged 11 to 14 years, evaluating the associations among the child perception questionnaire (CPQ11-14), the self-esteem subscale of the child health questionnaire, and the dental aesthetic index (DAI). **Results:** The CPQ11-14 scores were significantly related to the self-esteem scores and the DAI ratings. Regression analysis showed that self-esteem contributed significantly to the variance in CPQ11-14 scores. However, the amount of variance explained by normative measures of malocclusion was relatively small. **Conclusions:** The impact of malocclusion on quality of life is substantial in children with low self-esteem. Compared with normative measures of malocclusion, self-esteem is a more salient determinant of OHRQoL in children seeking orthodontic treatment. Longitudinal data will be of value to confirm this finding. (Am J Orthod Dentofacial Orthop 2008; 134:484-9)

The child perception questionnaire (CPQ11-14) is a generic oral-health-related quality of life (OHRQoL) instrument designed to assess the adverse impacts of oral conditions in children aged 11 to 14 years.[1] The CPQ11-14 is becoming an increasingly popular tool in orthodontic outcome research,[2] because of its demonstrable psychometric properties.[3,4] However, when its performance was assessed against clinical indicators, modest associations were often observed.[3,5,6]

The inconsistencies between clinical indicators and reported OHRQoL agree with anecdotal clinical experience. Some children have remarkable levels of concern for the most minor anomalies, and, paradoxically, others are tolerant of severe occlusal problems. More adolescents with good occlusion who feel dissatisfied with their teeth have been reported.[7-9] Moreover, patients' concerns regarding orthodontic treatment do not always agree with professional evaluations.[10,11] Accordingly, it is reasonable to assume that the relationship between reported OHRQoL and malocclusion is most likely mediated by other factors.[6,12] Studies in the medical literature have stressed the importance of innate psychological attributes, such as self-esteem (SE), in predicting the effect of health conditions on the quality of life.[13,14] Spilker[15] advocated controlling for psychological parameters whenever quality of life is used as a primary outcome. Few studies have examined parallel associations in children seeking orthodontic treatment.[16,17] In a study of Brazilian schoolchildren, those with low SE were found to be more sensitive to the esthetic effects of malocclusion.[17] Similarly, a study of potential orthodontic patients in Nigeria found that children with high SE most frequently did not express orthodontic concerns.[18]

Although many cross-sectional studies reported significant associations between malocclusion and SE in adolescents,[18-20] longitudinal evaluations often failed to document a clear-cut cause-and-effect relationship.[21-28] The findings of these studies should shed light on the way we view SE as an end point outcome in orthodontic psychosocial research. It also supports the argument of the role of SE as an effect modifier. This hypothesis agrees with empirical psychological evidence that denotes the stability of the SE construct as a personal resource that might moderate the effects of conditions or events.[29,30] Self-concept is broad ranging and relates to personal self-concept (facts or one's own opinions about oneself), social self-concept (one's perceptions about how one is regarded by others), and self-ideals (what or how one would like to be).[31] With this definition, it is unlikely that impaired perception of orofacial appearance as a result of malocclusion would translate to

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diminished SE. The relationship between normative measures of malocclusion, SE, and OHRQoL should be clarified if we are to meaningfully interpret the results of clinical investigations using OHRQoL outcomes.

Therefore, we examined the role of SE as a mediator influencing OHRQoL outcomes in children seeking orthodontic treatment. We hypothesized that children with high SE would have better OHRQoL than those with low SE.

MATERIAL AND METHODS

Participants in the study were children aged 11 to 14 years, attending orthodontic clinics at the Faculty of Dentistry, University of Toronto, in Canada. Most children were motivated by their parents to seek orthodontic consultation. A convenient consecutive sampling approach was used. The children were recruited at their first visit for orthodontic screening. The parents signed a consent form, and all children agreed to participate. To be eligible, the child had to be fluent in English and in good general health. Children with severe dentofacial deformities were excluded. The University Research Ethics Board approved all study procedures.

All children completed the CPQ11-14 and the SE subscale of the child health questionnaire (CHQ-CF87) before treatment. The questionnaires were completed by the children unassisted by parents or investigators. The dental aesthetic index (DAI) was used to determine the clinical need for orthodontic treatment. Age, sex, and ethnic background were recorded because of their potential associations with both outcome and explanatory variables.[24,32] Socioeconomic status, however, was not assessed because it was previously shown to have no bearing on CPQ11-14 scores when examined in similar groups.[2,6]

The CPQ 11-14 is a child OHRQoL instrument. The age-specific questionnaire (11-14 years) consists of 37 items, grouped into 4 domains: oral symptoms (OS), functional limitations (FL), emotional well-being (EW), and social well-being (SW). Each item asked about the frequency of events, as applied to the teeth, lips, and jaws, in the last 3 months. The response options were "never, once or twice, sometimes, often," and "every day or almost every day." Although the instrument is designed to yield an overall score, a separate score can be generated for each of the 4 subscales. Higher scores signify worse OHRQoL. The validity and reliability of this questionnaire have been established in clinical and general population samples.[1,3,4]

The children's SE was measured by using the SE subdomain of the CHQ-CF87, a widely used and validated self-report instrument. The following dimensions of SE are captured in the 14-item measure developed by Landgraf and Abetz[33]: satisfaction with school and athletic ability, looks or appearance, ability to get along with others and family, and perception of life overall. Responses are given on a 5-point Likert scale (very satisfied to very unsatisfied). Low SE scores indicate significant dissatisfaction with abilities, looks, family and peer relationships, and life overall. Specific instructions confirming the generic nature of the measure were added at the beginning of the questionnaire.

The severity of each child's orthodontic condition was assessed by using study models taken at the initial visit with a widely used orthodontic index, the DAI,[34] which measures the social acceptability of a child's dental appearance. The rating is based on the measurement of 10 occlusal traits; each trait is multiplied by a weight. The products are summed, and a constant is added to give the DAI score; scores range from 13 (most acceptable) to 100 (least acceptable) and can be collapsed into 4 malocclusion severity levels: 13 to 25, minor or none; 26 to 31, definite; 32 to 35, severe; and 36 and over, handicapping.[35]

The DAI ratings were recorded by 3 trained and calibrated examiners. To assess intra- and interexaminer reliability, the raters independently assessed a random 10% sample of the models and then reassessed the models 1 week later. Intraexaminer reliability for the DAI raters was almost perfect with intraclass correlation coefficients of 0.96, 0.91, and 0.97, respectively, and the interexaminer reliability was high at 0.81.

Statistical analysis

The data were analyzed by using SPSS software (version 12, SPSS, Chicago, Ill). Additive scale and subscale scores for the CPQ11-14 and the CHQ-CF87 were calculated by summing the item response codes. Data analyses included descriptive statistics, bivariate analyses, and multiple regression models.

RESULTS

One hundred ninety-nine children (102 girls, 97 boys) entered the study. Their mean age was 12.7 years (SD, 1.1). Seventy-six percent of the subjects were white. The sample distribution of DAI categories was minor malocclusion (8.4%), definite malocclusion (27.2%), severe malocclusion (20.4%), and handicapping malocclusion (44%). The truncated distribution can be expected in such a sample of children seeking orthodontic treatment at a teaching institution. SE scores ranged

Table I. Summary statistics for the study variables

	OS domain Mean (SD) range	*FL domain Mean (SD) range*	*EW domain Mean (SD) range*	*SW domain Mean (SD) range*	*Total CPQ11-14 Mean (SD) range*	*DAI Mean (SD) range*
Low SE children‡ (N = 71)	6.6 (2.9) 0-14	6.9 (5.3) 0-23	7.7 (5.8) 0-24	7.1 (6.4) 0-29	28.4 (16.3) 4-73	33.7 (6.9) 20-59
High SE children‡ (N = 128)	5.2 (3.2)* 0-17	4.8 (4.1)* 0-19	4.7 (4.9)† 0-24	4.3 (4.8)† 0-24	19.4 (13.2)† 3-68	35.8 (9.0) 17-74

*Difference statistically significant at $P < 0.01$.
†Difference statistically significant at $P < 0.001$.
‡SE classification, using norms reported by Landgraf and Abetz.[33]

Table II. Pearson correlation coefficient between reported total and subscale OHRQoL (CPQ11-14) scores and SE according to malocclusion category‡

DAI category	*OS domain*	*FL domain*	*EW domain*	*SW domain*	*Total CPQ11-14*
Minor N = 16	−0.13	−0.49	−0.42	−0.33	−0.54*
Definite N = 52	−0.15	−0.36†	−0.55†	−0.37†	−0.45†
Severe N = 39	−0.19	−0.24	−0.41†	−0.39*	−0.39*
Handicapping N = 84	−0.25*	−0.25*	−0.23*	−0.24*	−0.31†
Overall sample N = 191	−0.27†	−0.32†	−0.42†	−0.38†	−0.43†

*Correlation significant at 0.05 level (2-tailed).
†Correlation significant at 0.01 level (2-tailed).
‡Malocclusion classification, using cutoff points from Estioko et al.[35]

Table III. Pearson correlation coefficients between reported total and subscale OHRQoL (CPQ11-14) scores and DAI according to SE category‡

SE category	*OS domain*	*FL domain*	*EW domain*	*SW domain*	*Total CPQ11-14*
Low SE children‡ N = 71	0.05	0.04	0.04	−0.03	0.01
High SE children‡ N = 128	−0.08	0.14	0.26†	0.28†	0.23*
Overall sample N = 191	−0.02	0.09	0.17*	0.19†	0.16*

*Correlation significant at 0.05 level (2-tailed).
†Correlation significant at 0.01 level (2-tailed).
‡SE classification, using norms reported by Landgraf and Abetz.[33]

from 50 to 100 with a mean score of 84 (SD = 13.4). The sample mean SE score was not significantly different from that of reported norms for normal schoolchildren (mean, 81.8; SD, 15.8).[33] DAI scores, total, and individual subscale CPQ11-14 scores for high and low SE children are summarized in Table I. Low SE children had significantly higher total CPQ11-14, OS, FL, EW, and SW domain scores than high SE children even though they had similar malocclusions (DAI scores).

The Pearson correlation between the overall CPQ11-14 and SE scores was significant ($r = -0.43$, $P < 0.01$), indicating moderate negative association between the 2 scales. Similar associations were observed between SE and all 4 CPQ11-14 subscales for the overall sample and for the sample divided according to malocclusion severity (Table II): OS ($r = -0.27$, $P < 0.01$); FL ($r = -0.32$, $P < 0.01$); EW ($r = -0.42$, $P < 0.01$), and SW ($r = -0.38$, $P < 0.01$). A significant, but weak, correlation was noted between the overall CPQ11-14 scores and DAI scores ($r = 0.16$, $P < 0.05$). When the association was examined according to the SE categories, children with low SE had no correlation for DAI scores and CPQ11-14 scores (Table III).

Hierarchical multiple regression models were used to explore the relationship between SE and CPQ11-14 and its subscale scores. Two key issues were addressed: the total amount of variance explained, and the independent and separate variance contributions of the clinical condition (DAI scores) and psychological factors (SE).

After controlling for age, sex, and ethnicity, the 2 main effects (SE and DAI) were entered into the regression equation and tested for overall significance.

Table IV. Amount of variance explained for overall CPQ11-14 and subscale scores

Dependent variable	*Independent variable*	*Total adjusted R^2*	*R^2 change*	*Standard beta*	*t*	P *value*
Total CPQ11-14	Step 1: DAI	0.183	0.017	0.18	2.70	<0.01
	Step 2: SE		0.166	−0.41	−6.26	<0.001
OS domain	Step 1: DAI	0.036	−0.013	0.00	0.01	0.99
	Step 2: SE		0.049	−0.23	−3.27	<0.01
FL domain	Step 1: DAI	0.106	0.010	0.10	1.45	0.15
	Step 2: SE		0.096	−0.32	−4.57	<0.001
EW domain	Step 1: DAI	0.166	0.015	0.21	3.11	<0.01
	Step 2: SE		0.141	−0.39	−5.90	<0.001
SW domain	Step 1: DAI	0.144	0.036	0.19	2.81	<0.01
	Step 2: SE		0.108	−0.34	−4.96	<0.001

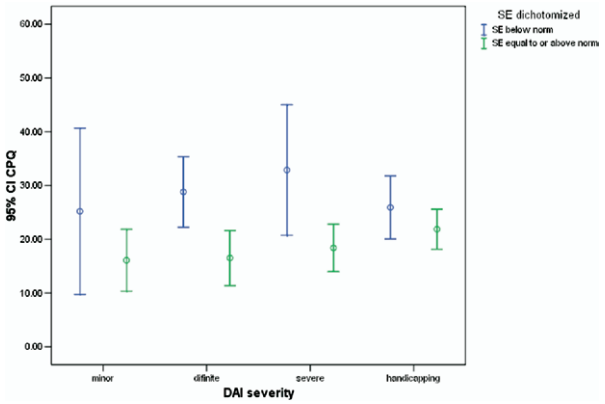

Fig 1. Error bars comparing CPQ11-14 scores between high and low SE children across the malocclusion categories.

Table IV summarizes the results of the regression model and the total amount of variance, in overall and subscale CPQ11-14 scores, explained by introducing each variable.

Eighteen percent of the total variance in CPQ11-14 scores was explained by the combined model. The explanatory power was highest for the EW scale (adjusted $R^2 = 0.17$) and lowest for the OS subscale (adjusted $R^2 = 0.04$). As illustrated in the Figure, children with low SE consistently reported worse OHRQoL across the different DAI categories than children with high SE.

Less than 2% of the variance in CPQ11-14 scores was explained by age, sex, or malocclusion as measured by DAI scores. Of the total variance in CPQ11-14 scores, approximately 17% was attributed to SE alone. Of the CPQ11-14 subscales individually, the contribution of the main effect of SE was significant for all subscales. As expected, the most pronounced effect was for the EW and SW subscales. The independent effect of DAI was small overall, but significant for both the EW and SW subscales. DAI ratings did not contribute to the FL or OS subscales.

DISCUSSION

These results support the postulated mediator role of SE when evaluating OHRQoL in children coming for orthodontic treatment. This indicates that the child's psychological profile can influence the social and emotional impacts of malocclusion, because those with high SE are more likely to report better OHRQoL.

This sample of Canadian children seeking orthodontic treatment reported significantly more negative oral impacts (mean CPQ11-14, 22.8; SD, 15.2) than schoolchildren of comparable age in the United Kingdom[36] and New Zealand.[3] The reported psychosocial impacts are similar to those reported for Nigerian orthodontic patients, emphasizing the negative consequences of malocclusion.[37]

The tenuous but significant association between DAI scores and patient-based measures concurs with earlier studies.[2,3,5,6,18] Since the correlation coefficient was small, we cannot conclusively state that increased malocclusion severity produced a direct increase in CPQ11-14 scores. This was further confirmed by the minor independent contribution of DAI scores to the variance in CPQ11-14 scores. Interestingly, CPQ11-14 scores reported by children with low SE were not correlated with the normative severity of malocclusion (Table III). This seems to suggest that children with low SE report negative OHRQoL impacts that do not necessarily correspond to their orthodontic treatment needs. Obviously, there are many reasons that children seek orthodontic treatment, and these are not always related to the severity of malocclusion.[38]

As hypothesized, high SE was associated with better OHRQoL. The moderately low correlation coefficient indicates that other factors might contribute to both constructs. The variance in CPQ11-14 scores in children coming for orthodontic treatment was explained by the child's SE to a reasonable extent.[39]

Not surprisingly, analysis of the CPQ11-14 domain correlations showed that SE and DAI mostly contrib-

uted to the child's emotional and social well-being. This is logical when we consider that the most common reason for seeking orthodontic treatment is to correct dental esthetics.[11,40,41] As previously demonstrated by many investigators, it is unlikely that oral symptoms (bleeding gums, pain in the teeth)[42-44] and functional limitations (speech problems, difficulty in mouth opening, and eating) are greatly influenced by psychological factors or the normative severity of malocclusion.[45,46]

The SE results support the findings of Marques et al,[17] who identified low SE as a risk factor for worsening malocclusion esthetic effects, and Onyeaso,[18] who found significant positive associations between SE and orthodontic concern. Our findings are also consistent with associations reported for different age groups.[16,47] The effect of personality traits on perceived impacts of dental esthetics is similar to that reported by Klages et al.[48]

This study had some limitations. The lack of temporality limited the confidence in establishing the direction of association in this study. Although SE was significantly associated with OHRQoL, the question remains whether SE improves OHRQoL, or vice versa. There are arguments for the association in either direction or both directions.[49] The reported results represent only the baseline of an inception-controlled cohort study. All patients will be followed and assessed after orthodontic treatment to evaluate changes in OHRQoL and to ascertain the proposed hypothesis. Meanwhile, our belief that SE is a personal resource that facilitates coping with less favorable conditions such as poor dental esthetics is corroborated by many psychological studies including Harter's popular article about SE.[50]

This study also has implications for topical orthodontic decision-making research. The current consensus is that decisions should be based on individual psychosocial indications.[51,52] The self-report CPQ11-14 is potentially a proxy measure to replace subjective clinical opinions for determining treatment timing especially for psychosocially compromised children. This is because the CPQ11-14 reflects the contribution of the child's SE in ameliorating the clinical severity of malocclusion; this allows for prioritization of treatment needs according to child's level of daily disruption. With this approach, dental services should correspond more closely to consumer-based health needs and focus more on improving the quality of life.

CONCLUSIONS

SE significantly impacted the relationship between malocclusion and well-being in children seeking orthodontic treatment. Longitudinal data will be of value to confirm this finding. Investigators should consider the need to control for baseline psychological attributes when assessing OHRQoL outcomes in orthodontics.

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